Biological Nitrate Removal Study in Acton

Summary
Many groundwater sources throughout North America have nitrate levels near or above the drinking water standard of 10 milligrams per liter (mg/L) as nitrogen. The major sources of nitrates in drinking water are runoff from fertilizer use, leaking from septic tanks, sewage, and erosion of natural deposits. Infants below six months who drink water containing nitrate in excess of the drinking water standard could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.

The Los Angeles County Department of Public Works, Waterworks Division, (Waterworks) operates several groundwater systems within unincorporated portions of Los Angeles County. Some of these groundwaters contain nitrate at levels near or above the drinking water standard. Waterworks currently blends groundwater with high nitrate concentrations with water containing low nitrate concentrations to maintain nitrate levels below the drinking water standard in the blended water. However, blending is not a sustainable long-term strategy, given the increasing trend of nitrate concentrations in groundwater over time. In addition, current groundwater wells high in nitrate are unable to run at full capacity and thus, are not operating efficiently. Therefore, Waterworks has begun evaluating the application of well-head treatment systems for nitrate. Conventional nitrate treatment processes include ion exchange or reverse osmosis. Both treatment types are expensive, energy intensive, and produce waste brine that is very difficult and costly to dispose of. Disposal of high brine waste typically requires trucking it to an industrial treatment plant outside of the County.

Starting in 2012, Waterworks partnered with the Water Research Foundation and Water Quality and Treatment Solutions, Inc. to conduct a comprehensive biological nitrate removal study in Acton. The study will evaluate the effectiveness of a new biological process that removes nitrate from groundwater using natural bacteria. The figure below shows the two columns filled with granular activated carbon which allows enough contact time for the bacteria to consume oxygen and reduce the nitrate. Air is then injected into the third, clear column to replenish the oxygen. The study will identify any regulatory, operational, and maintenance requirements for a full-scale implementation of the treatment.

Benefits to Environmental Resources
A full-scale implementation of the study will provide Waterworks' customers with better water quality from much more reliable, sustainable, local groundwater. The process uses bacteria present within the groundwater which creates a natural and benign waste that can easily be disposed of in the sewer or septic system. Biological nitrate removal is much less energy intensive than conventional treatment methods; therefore, reducing emissions that would otherwise be created from additional energy production.

Contribution to wellbeing of DPW employees and the County Community

Water shortage is a regional issue in Los Angeles County due to limited supply availability, which is why it is vital to collaborate to resolve the resource issue. The success of the technology will provide Acton residents and businesses with an additional source of drinking water, a resource that is in high demand because of the over-drafting of aquifers throughout the state. It could also prove beneficial for millions of people across the western United States where nitrate concentrations in groundwater exceed the Federal water quality standard. The project will greatly contribute to enriching community life by providing clean and healthy drinking water in a sustainable manner.

Economical contribution

The Project presents an approach to lower the financial cost of nitrate treatment compared to other alternatives such as reverse osmosis or ion-exchange. It also produces a benign waste that can easily be disposed of in the sewer or septic system, saving the costs associated with expensive brine pipelines or trucking. Finally, Waterworks could reduce the purchase of expensive, unreliable imported water. Waterworks would potentially save approximately $400,000 per year if groundwater could be utilized to meet all customer demands in Acton.

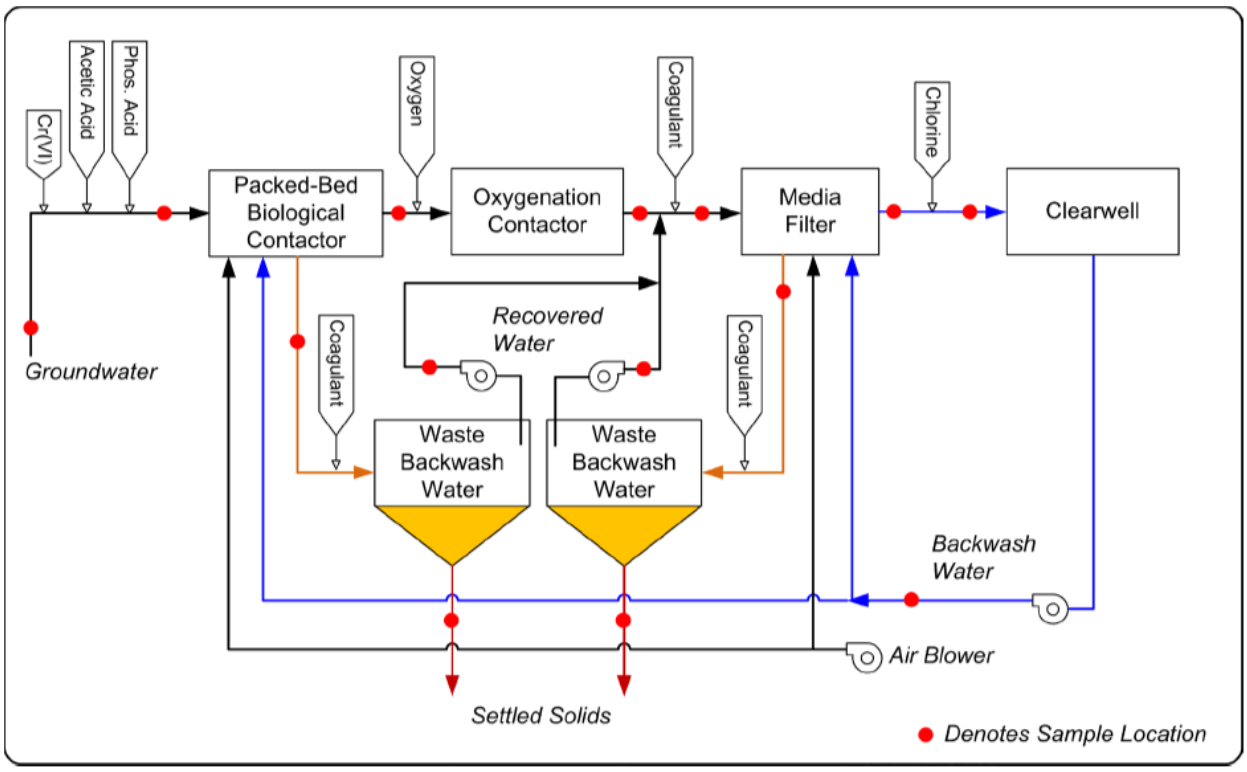

Figure 3.2 – BDN Pilot Plant Process Flow Diagram